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I claim:

1 1. A modular control apparatus for a power impact tool, the tool comprising at least one
2 motor, the modular control apparatus being releasably attachable to the tool.

1 2. The modular control apparatus of claim 1, further comprising structures and channels
2 for intercepting a flow of energy to the motor and controlling the flow of energy to the
3 motor.

1 3. The modular control apparatus of claim 1 adapted for controlling the duration of flow
2 of a compressible fluid at a discharge port of the modular control apparatus.

1 4. The apparatus of claim 3 comprising:

2 a first channel, into which a compressible fluid may be received;

3 a second channel, from which the compressible fluid may be discharged from the
4 apparatus;

5 a valve, through which the compressible fluid may pass from the first channel to
6 the second channel;

7 a third channel, through which the compressible fluid may pass from the first

channel to a reservoir;

a fourth channel, through which the compressible fluid may pass from the first channel to a portion of the valve chamber;

a fifth channel, through which the compressible fluid may pass from the reservoir to a portion of the valve chamber;

a sixth channel, through which the compressible fluid may be vented from the valve chamber; and

a structure containing the channels, the valve, and the reservoir, the structure being releasably attachable to a tool.

5. The apparatus of claim 4 wherein the first channel comprises:

a first end comprising at least one of a connector, a seal, and a surface for receiving a seal, configured to make a fluid-tight connection with a source of compressible fluid;

a second end comprising an input port into the valve chamber;

a third end comprising a port into a first end of the fourth channel; and

a fourth end comprising a port to the third channel.

16. The apparatus of claim 4 wherein the second channel comprises:

a first end comprising a port from the valve; and

a second end comprising at least one of a connector or a seal for making a fluid-tight connection at least one of directly or indirectly with a tool.

17. The apparatus of claim 4 wherein the valve comprises:

a valve chamber comprising a plurality of ports;

a biasing mechanism; and

a valve body confined within the valve chamber and provided at least one degree of freedom of motion therein.

18. The apparatus of claim 7 wherein the valve body is biased to a biased position by the biasing mechanism, the valve body in the biased position operative to pass the compressible fluid through the valve;

9. The apparatus of claim 8 wherein the valve body may be moved to an anti-biased position, the valve body in the anti-biased position operative to prevent the flow of compressible fluid through the valve.

10. The apparatus of claim 7 wherein the biasing mechanism is a spring.

11. The apparatus of claim 4 wherein the third channel comprises:

a first end sized and shaped for receiving compressible fluid from the fourth end port of the first channel;

a second end comprising a port sized and shaped for discharging compressible fluid into the reservoir; and

a middle portion comprising a flow restriction.

12. The apparatus of claim 11 wherein the flow restriction comprises a variable flow restriction.

13. The apparatus of claim 12 wherein the variable flow restriction comprises a needle

valve.

14. The apparatus of claim 4 wherein the fourth channel comprises:

a first end receiving compressible fluid from the first channel; and

a second end comprising a port to the valve chamber operative to discharge compressible fluid into a portion of the valve chamber to latch the valve body in the anti-biased position when the valve body moves to the anti-biased position;

15. The apparatus of claim 4 wherein the fifth channel comprises:

a first end comprising a port for receiving compressible fluid from the reservoir; and

a second end comprising a port for discharging compressible fluid into a portion of the valve chamber.

16. The apparatus of claim 15 wherein the portion of the valve chamber is an expandible and contractible sub-chamber, the sub-chamber having at least one moveable wall.

1 17. The apparatus of claim 16 wherein the at least one moveable wall comprises at least
2 one surface of the valve body.

1 18. The apparatus of claim 4 wherein the structure comprises a generally solid block
2 sized and shaped to contain the channels, valve, needle valve, and reservoir and further
3 sized and shaped to accommodate attachment mechanisms, at least one of internally and
4 externally, for attaching the apparatus to a tool.

1 19. The apparatus of claim 18 wherein the attachment mechanism includes alignment
2 mechanisms.

1 20. The apparatus of claim 19 wherein alignment mechanisms include alignment holes
2 in the generally solid block of the modular control apparatus, the holes sized and shaped
3 to receive corresponding rods extending from the tool.

1 21. The apparatus of claim 20 wherein the alignment holes and corresponding rods will
2 align in only one orientation of the modular control apparatus relative to the tool.

1 22. The apparatus of claim 18 wherein the generally solid block comprises an assembly
2 of a plurality of sub-blocks.

1 23. The apparatus of claim 22, wherein the plurality of sub-blocks comprises:

2 a first sub-block containing the reservoir, the valve chamber, a portion of the first
3 channel, the second channel, the fourth channel, the fifth channel, and at least one
4 attachment mechanism for attaching the apparatus to the tool; and

5 a second sub-block containing the third channel and the remaining portion of the
6 first channel.

1 24. The apparatus of claim 4, further comprising a handle, the handle comprising:

2 a housing, shaped and sized to be griped by hand;

3 a channel for compressible fluid, the channel leading to an input of the modular
4 control apparatus;

5 an inlet port for receiving a supply of compressible fluid into the channel;

6 a manually-operated valve for controlling the flow of compressible gas through

the channel;

25. The apparatus of claim 1 wherein the tool further comprises:

at least one housing covering the at least one motor;

at least one handle;

at least one manually operated valve operative to control a flow of compressible fluid from a supply thereof; and

at least one part of an attachment mechanism for releasably attaching the modular control apparatus to the tool;

26. The apparatus of claim 25 further comprising at least one alignment mechanism for aligning a modular control apparatus to the tool;

27. The apparatus of claim 26 wherein the alignment mechanism and the attachment mechanism are integrated into a single mechanism.

28. A modular control apparatus for a pneumatic torque wrench tool, comprising:

a body, comprising a generally solid block structure that is releasably attachable to a pneumatic torque wrench tool;

a first channel in the body for receiving compressed air from at least one of the tool and an outside source;

a second channel in the body for discharging compressed air at least one of directly and indirectly into an inlet of a pneumatic motor of the tool;

a valve in the body, situated between the first and second channels, configured and operative to shut off the discharge of pressurized air at an operator-adjustable time; and

an adjustment mechanism partially internal to the body and partially protruding from the body, the protruding portion sized and shaped to be manipulated by an operator of the tool to adjust the time at which the valve shuts off the discharge of pressurized air to the tool.

1 29. A tool, comprising:

2 a housing;

3 at least one motor within the housing, the motor powered by the energy of a
4 compressible fluid, the motor operable to rotate a drive shaft; and

5 a modular control apparatus releasably attached to the tool;

1 30. The tool of claim 29 wherein the modular control apparatus comprises:

2 a channel for the compressible fluid, flow of the compressible fluid through the
3 channel being controlled by an automatic valve, the channel further comprising
4 an input port and a discharge port; and

5 an adjustment mechanism partially protruding from the modular control
6 apparatus, the adjustment mechanism configured to be manipulated by a user of
7 the tool.

1 31. The tool of claim 30 wherein the modular control apparatus further comprises:

at least one releasable mechanical connector for connecting the apparatus to the tool;

a first releasable fluid connection between the discharge port of the apparatus and a motor input port of the tool; and

a second releasable fluid connection between a supply of compressed fluid and the input port of the apparatus, the second releasable fluid connection comprising at least one of a fluid connection to a compressible fluid supply hose and a fluid connection to a supply of compressible fluid from the tool.

32. The apparatus of claim 31 wherein the at least one releasable mechanical connector comprises at least one connection actuator, the connection actuator comprising a user-manipulated device for connecting and disconnecting a plurality of connections between the apparatus and the tool.

33. The apparatus of claim 32 wherein a portion of the at least one connection actuator is integral to the apparatus and the remaining portion of the connection actuator is integral to the tool.

34. The apparatus of claim 30 wherein the valve further comprises:

a valve chamber comprising a plurality of ports;

an actuating chamber for receiving compressible fluid from a reservoir of compressible fluid; and

a valve body confined within the valve chamber and provided at least one degree of freedom of motion therein.

35. The apparatus of claim 34 wherein the actuating chamber is a portion of the valve chamber.

36. The apparatus of claim 34 wherein the actuating chamber comprises an expandible and contractible chamber.

37. The apparatus of claim 36 wherein at least one wall of the actuating chamber comprises a surface of the valve body.

38. The apparatus of claim 34 wherein the valve body contains a portion of the channel between the input port and the discharge port.

1 39. The apparatus of claim 34 wherein the at least one degree of freedom of motion
2 comprises at least one degree of freedom of translational motion.

1 40. The apparatus of claim 34 wherein the valve further comprises a latching channel for
2 receiving the compressible fluid into the expanded actuating chamber from the input
3 port, the compressible fluid operative to latch the valve by maintaining the expansion of
4 the actuating chamber.

1 41. The apparatus of claim 34 wherein the reservoir is configured to receive
2 compressible fluid from the input port through a channel with a flow restriction.

1 42. The apparatus of claim 41 wherein the flow restriction is a variable flow restriction.

1 43. The apparatus of claim 42 wherein the degree of flow restriction is determined by
2 the position of the adjustment mechanism.

1 44. The apparatus of claim 43 wherein the flow restriction and the adjustment
2 mechanism together comprise a needle valve.

1 45. The apparatus of claim 29 wherein the tool comprises a tool adapted to receive and
2 attach to the modular control apparatus.

1 46. The apparatus of claim 45 wherein a compressible fluid supply port on the tool
2 aligns with the compressible fluid input port on the modular apparatus when the

3 compressible fluid discharge port of the modular control apparatus aligns with the
4 compressible fluid motor input port on the tool and mechanical connector portions of the
5 modular control apparatus align with the corresponding mechanical connector portions
6 of the tool.

1 47. The apparatus of claim 29 wherein the compressible fluid comprises air.

1 48. The apparatus of claim 47 wherein the tool comprises a pneumatic tool.

1 49. The apparatus of claim 48 wherein the pneumatic tool is a torque wrench.

1 50. The apparatus of claim 29 wherein the compressible fluid comprises dry nitrogen,
2 helium, or other compressible gas.

1 51. The apparatus of claim 29 wherein the input port further comprises a connector for
2 connecting to a supply channel, the supply channel being a source of compressible fluid.

1 52. The apparatus of claim 51 wherein the supply channel conducts the compressible
2 fluid at least one of through the tool and independent of the tool.

1 53. The apparatus of claim 29 wherein the valve includes a bias mechanism.

1 54. The apparatus of claim 53 wherein the bias mechanism comprises a spring.

1 55. The apparatus of claim 53 wherein the bias mechanism is configured to bias the
2 valve closed.

56. A method of using a modular control apparatus comprising the steps of:

providing a modular control apparatus;

aligning the modular control apparatus to a tool;

attaching the modular control apparatus to the tool;

adjusting the output of the modular control apparatus; and

applying the tool to a workpiece.

57. The method of claim 56 further comprising the steps of:

detaching the modular apparatus from the tool;

aligning the modular control apparatus to a second tool;

attaching the modular control apparatus to the second tool;

adjusting the output of the modular control apparatus; and

applying the second tool to a workpiece.

58. The method of claim 57 wherein the step of providing a modular control apparatus comprises the step of providing a fluidic modular control apparatus.

59. The method of claim 58 wherein the step of providing a fluidic modular control apparatus comprises the step of providing a pneumatic modular control apparatus.

60. A method of using a pneumatic modular control apparatus comprising the steps of:

attaching the pneumatic modular control apparatus to a pneumatic tool;

connecting a compressed-air supply channel to an input port of the pneumatic modular control apparatus;

channeling a compressed-air discharge from a discharge port of the pneumatic modular control apparatus to the inlet of a pneumatic motor of the pneumatic tool;

adjusting the pneumatic modular control apparatus; and

applying the pneumatic tool to the workpiece.

61. The method of claim 60, further comprising the step, prior to applying the tool to the workpiece, of attaching a workpiece adapter at least one of directly and indirectly to a drive shaft of the motor of the tool.

62. A method of making a modular control apparatus comprising the steps of:

forming a first sub-block to create a reservoir, a valve chamber, and a plurality of channels;

forming a second sub-block to create a flow channel having a valve seat for a needle valve, the channel sized and positioned to fluidically connect, when mated with the first sub-block, the reservoir to the channel in the first block that receives the input of the compressible fluid;

forming a valve stem channel in the second sub-block, the valve stem channel suitable to receive the stem of a needle valve, the channel sized and positioned to align the needle with a valve seat;

forming a valve body;

forming a needle valve body;

installing the valve body into the valve chamber;

installing the needle valve in the needle valve seat of the second sub-block;

mating and releasably fastening the first and second sub-blocks together;

forming alignment features; and

at least one of forming and installing at least one attachment mechanism.

63. The method of claim 62 wherein installing the valve body comprises:

installing a seal;

inserting the valve body;

installing the bias mechanism; and

installing an o-ring bumper.

64. A method of making a pneumatic power impact tool adapted to receive a pneumatic modular control apparatus, the apparatus having an input port and a discharge port, the method comprising:

providing a pneumatic power impact tool having a handle, a trigger valve for controlling the input supply of compressed air, and an air motor having an inlet for compressed air;

forming a channel from the output of the trigger valve to a trigger valve outlet port configured to align and connect with the input port of the pneumatic modular control apparatus;

forming a channel from the inlet of the air motor to an air motor supply port configured to align and connect with the discharge port of the pneumatic modular control apparatus; and

forming a housing, said housing covering the air motor, channels, and the trigger valve, said housing also comprising the air motor supply port, the trigger valve outlet port, alignment mechanisms, and connection mechanisms.

65. A pneumatic power impact tool comprising

a housing;

an air motor within the housing; and

a manually-adjustable, releasably-attachable, modular control apparatus.

66. The tool of claim 65 further comprising a workpiece adapter.

67. A method of making an apparatus for a power impact tool comprising:

providing an air motor within a housing, the housing and air motor adapted to receive a modular control apparatus; and

attaching a modular control apparatus.

1 68. A method of using a modular control apparatus comprising the step of:

2 attaching the modular control apparatus to a power impact tool.

1 69. A method as in claim 68, comprising the step of:

2 adjusting the modular control apparatus.